



What is the efficacy/effectiveness of
antenatal care and the financial and
organizational implications?

December 2003

ABSTRACT

Health Evidence Network (HEN) synthesis report on the efficacy/effectiveness of antenatal care

Antenatal care, also known as prenatal care, is the complex of interventions that a pregnant woman receives from organized health care services. The number of different interventions in antenatal care is large. These interventions may be provided in approximately 12-16 antenatal care visits during a pregnancy. The purpose of antenatal care is to prevent or identify and treat conditions that may threaten the health of the fetus/newborn and/or the mother, and to help a woman approach pregnancy and birth as positive experiences. To a large extent antenatal care can contribute greatly to this purpose and can in particular help provide a good start for the newborn child.

This report is HEN's response to a question from a decision-maker. It provides a synthesis of the best available evidence, including a summary of the main findings and policy options related to the issue.

HEN, initiated and coordinated by the WHO Regional Office for Europe, is an information service for public health and health care decision-makers in the WHO European Region. Other interested parties might also benefit from HEN.

This HEN evidence report is a commissioned work and the contents are the responsibility of the authors. They do not necessarily reflect the official policies of WHO/Europe. The reports were subjected to international review, managed by the HEN team.

When referencing this report, please use the following attribution:

Banta D (2003). *What is the efficacy/effectiveness of antenatal care and the financial and organizational implications?* Copenhagen, WHO Regional Office for Europe (Health Evidence Network report; <http://www.euro.who.int/Document/E82996.pdf>, accessed [day month year]).

Keywords:

PERINATAL CARE – ECONOMICS – ORGANIZATION AND ADMINISTRATION
PREGNANCY COMPLICATIONS – PREVENTION AND CONTROL
MATERNAL WELFARE
COST-BENEFIT ANALYSIS
EVIDENCE-BASED MEDICINE
HEALTH POLICY
DECISION SUPPORT TECHNIQUES
EUROPE

Address requests about publications of the WHO Regional Office to:

- *by e-mail*

publicationrequests@euro.who.int (for copies of publications)

permissions@euro.who.int (for permission to reproduce them)

pubrights@euro.who.int (for permission to translate them)

- *by post*

Publications

WHO Regional Office for Europe

Scherfigsvej 8

DK-2100 Copenhagen Ø, Denmark

© World Health Organization 2003

All rights reserved. The Regional Office for Europe of the World Health Organization welcomes requests for permission to reproduce or translate its publications, in part or in full.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where the designation "country or area" appears in the headings of tables, it covers countries, territories, cities, or areas. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

The World Health Organization does not warrant that the information contained in this publication is complete and correct and shall not be liable for any damages incurred as a result of its use. The views expressed by authors or editors do not necessarily represent the decisions or the stated policy of the World Health Organization.

Summary	4
The issue.....	4
Findings.....	4
Policy considerations.....	4
Introduction	5
Sources for this review	6
Findings from research and other evidence.....	6
Antenatal care activities found to be effective	6
Antenatal care activities not found to be effective	8
Current debate in the field	9
Other aspects	10
Cost-effectiveness of antenatal care	10
Ethical considerations in antenatal care	10
Particularly successful cases from the European Region.....	10
Unsuccessful cases from the European Region.....	10
Conditions for successful implementation	11
Conclusions	11
References	12
Annex 1. Perinatal and maternal deaths	14
Annex 2. Search strategy.....	16
Annex 3. The new WHO antenatal care model basic component checklist.....	17

Summary

The issue

Antenatal care, also known as prenatal care, is the complex of interventions that a pregnant woman receives from organized health care services. The number of different interventions in antenatal care is large. These interventions may be provided in approximately 12-16 antenatal care visits during a pregnancy. The purpose of antenatal care is to prevent or identify and treat conditions that may threaten the health of the fetus/newborn and/or the mother, and to help a woman approach pregnancy and birth as positive experiences. To a large extent antenatal care can contribute greatly to this purpose and can in particular help provide a good start for the newborn child.

Many questions have been posed about the health benefits of antenatal care, especially in relation to its costs. Given the limited resources of health care and the wide range of services provided as part of antenatal care, such questions must be dealt with. Care should be appropriate, cost-effective and based on the needs of the specific pregnant woman.

Findings

Observational studies have clearly demonstrated that antenatal care prevents health problems for both mother and child. Yet until fairly recently, little was known about which elements of antenatal care were particularly valuable. Research shows that many antenatal interventions are unnecessary or of unproven benefit. Nevertheless, components of antenatal care and timing continue to be introduced without scientific evaluation.

In general terms, antenatal care is relatively expensive. In a multi-country randomized trial carried out by the World Health Organization (WHO), the average cost was about US \$3000 per pregnant woman in 1996. The main cost of antenatal care was found to be due to the interventions that follow from the suspected problems found during the process of care. Therefore, antenatal care needs to be scrutinized and planned carefully. WHO has developed and evaluated a simplified model of care (*I*) and has demonstrated in a large study that it provides the benefits of more complicated models while tending to save money.

Policy considerations

1. Antenatal care is one of the most important services in health care. Every pregnant woman should have full access to it.
2. Excessive, unneeded and unproven interventions are often provided to women with normal pregnancies. A simplified model of care, as developed by WHO, based on evidence of benefit, seems quite appropriate.
3. Many antenatal interventions have never been evaluated, and there is a great need for more research.

The author of this HEN synthesis report is:

Professor David Banta, M.D., MPH
Senior Consultant,
World Health Organization
Chair, European Advisory Committee on Health Research (EACHR)
E-mail: Hdavidbanta@cs.com

Introduction

Pregnancy is one of the most important periods in the life of a woman, a family and a society. Extraordinary attention is therefore given to antenatal care by the health care systems of most countries. The goal of antenatal care is to prevent health problems in both infant and mother and to see that each newborn child has a good start. The care provided needs to be appropriate and not excessive. New technologies need to be implemented continually, while older services need to be reconsidered. The care for each pregnant woman needs to be individualized based on her own needs and wishes.

Antenatal care, for purposes of this report, is all the care that a pregnant woman receives from organized health services (2). The primary aims of this care are to:

- detect early factors that may heighten the perinatal risk of both individual pregnancies and members of vulnerable groups;
- intervene to improve outcomes;
- educate all who provide or receive care; and
- help make pregnancy and birth a positive life experience.

Antenatal care includes planning for pregnancy and continues into the early neonatal and postpartum period. Health services generally consider that it begins with a pregnant woman's first visit to receive antenatal care and continues until birth. The model of antenatal care in western Europe, North America and many other countries includes 12-16 visits to health care services by the pregnant woman, as well as provider visits to her home. The first visit ordinarily focuses on taking a detailed social, family, medical and obstetric history, carrying out a complete physical examination, and making a risk assessment, which requires a broad range of laboratory tests. Subsequent visits include simpler examinations, though some examinations are still conducted at every visit. Later in pregnancy, examinations focus on the status of the developing fetus and the preparation for a safe delivery.

An increasing number of complex examinations and interventions are becoming part of modern antenatal care. Besides all of these examinations and the treatment of any adverse conditions found, the pregnant woman may also receive health education and psychological and social support from the health services. As a result, the average pregnant woman in many countries receives 150 or more specific tests/examinations/interventions during pregnancy. This broad range of options makes evaluation of antenatal care a challenge.

It is generally assumed that antenatal care succeeds in meeting its goals. Thus, the main focus in assessing the effectiveness and cost-effectiveness of antenatal care is on the individual examinations and interventions and on the indications for their use. Not every possible intervention can be summarized in this report, but some of the more important ones will be covered.

The great majority of women have normal pregnancy outcomes without much intervention. In developed countries, the perinatal mortality rate is around 5 to 10 per 1000 (see Figs. 1 and 2 in Annex 1). Such a low risk is difficult to improve on. Poorer countries have higher rates of complications and can improve such rates through relatively simple antenatal care.

Assessment of antenatal care should be carried out by well designed clinical trials for each intervention (3). Ideally, such assessment should be done by a randomized controlled trial (RCT), in

which pregnant women are randomly assigned to either an experimental group, which receives the intervention, or a control group, which does not. The difference between the outcomes of the two groups, reflected in measures such as perinatal and maternal mortality, complication rate, and rate of Caesarean birth or operative intervention in vaginal delivery, indicates the potential value of the interventions. Observational studies may shed also some light on the utility of these indications. In addition, qualitative (social science) research can be of value in highlighting various other aspects of antenatal care.

Sources for this review

A large number of systematic reviews of the evidence concerning the value of antenatal care have been carried out. The present review has relied in particular on the United States Preventive Services Task Force (USPSTF) reports (4), which include systematic reviews of several important interventions in antenatal care; the Cochrane Collaboration reports; a large synthesis of available evidence by Chalmers, Enkin and Keirse (5); and information from the World Health Organization (WHO), Geneva. See Annex 2 for details on the literature search strategy.

Many of the studies have been carried out in different settings and countries, and generalizing from these results for a specific site may be very difficult. Therefore, caution is called for in interpreting the results presented in the present report.

Findings from research and other evidence

Antenatal care activities found to be effective

The basic activities of antenatal care fall within three general areas:

1. screening for health and socioeconomic conditions likely to increase the possibility of specific adverse outcomes;
2. providing therapeutic interventions known to be beneficial; and
3. educating pregnant women about planning for safe birth, emergencies during pregnancy and how to deal with them.

Several recent reviews deal with patterns of routine antenatal care for low-risk pregnancy. A review of available literature indicates that the scope and intensity of antenatal care can be reduced for women at low risk without any adverse health consequences (6, 7) (see "Current debate in this field" below). It should be noted, however, that "low risk" is not very well defined, and that the diagnosis of "high risk" is not very precise and leads to much unnecessary intervention in pregnancy.

The USPSTF deals with several aspects of antenatal care. Those with a positive recommendation are:

- "Screening for preeclampsia with blood pressure measurement is recommended for all pregnant women at the first prenatal visit and periodically throughout the remainder of pregnancy." (4, p. 419) The importance of this screening and the treatment of any high blood pressure found have been emphasized by others (8, 9).
- "D (formerly Rh) blood typing and antibody screening is recommended for all pregnant women at the first prenatal visit. Repeat antibody screening at 24–28 weeks' gestation is recommended for unsensitized D-negative women." (4, p. 425) The Cochrane Review of this subject found that screening and treatment does prevent alloimmunization, but that the advantage of this over treatment of problems arising later with subsequent pregnancies may be small. Since the treatment is expensive, implementation of the evidence-based treatment depends on local circumstances (10).
- "Screening for iron deficiency anemia using hemoglobin or hematocrit is recommended for pregnant women and for high-risk infants." (4, p. 231) The Cochrane Review of this

subject (11) found that treatment of anaemia does result in a high blood count at the time of delivery, but that there was no evidence of specific health benefits to mother or child. Few data were found from communities where iron deficiency is common and anaemia a serious health problem.

- “The offering of amniocentesis or chorionic villus sampling (CVS) for chromosome studies is recommended for pregnant women at high risk for Down syndrome. The offering of screening for Down syndrome by serum multiple-marker testing is recommended for all low-risk pregnant women, and as an alternative to amniocentesis and CVS for high-risk women.”(4, p. 449)
- “Pregnant women . . . should be counselled on the potentially harmful effects of smoking on fetal and child health. The prescription of nicotine patches or gum is recommended as an adjunct for selected patients.”(4, 12) The Cochrane Review agrees (13) that interventions for promoting smoking cessation during pregnancy are effective in preventing low birth weights and preterm births.
- Providing pregnant women with specific nutritional guidelines to enhance fetal and maternal health is recommended (4, p. 625).

Other important interventions reviewed and recommended for effectiveness by the Cochrane Collaboration include:

- antiretroviral treatment for reducing the risk of mother-to-child transmission of HIV infection (one randomized trial showed that even a single dose was effective) (14);
- antibiotics for the treatment of asymptomatic bacteriuria (bacteria in the urine) (15);
- corticosteroids for pre-term births (including elective pre-term delivery) (16);
- antibiotics for syphilis diagnosed during pregnancy (17);
- treatment of diabetes in pregnancy (18;) and
- balanced protein/energy supplementation in pregnancy, which is likely to be beneficial (19).

A specific intervention of considerable importance is counselling about the possible effects of drinking alcohol during pregnancy on fetal and child health (20).

Other specific interventions found to be effective in selected and defined circumstances include antimalarial prophylaxis, calcium supplementation and iodine supplementation. Interventions likely to be effective include treatment for *Chlamydia* infection and gonorrhoea.

The interventions mentioned thus far include some of the more important ones in effective antenatal care. Chalmers, Enkin and Keirse (5) give a long list of interventions that had been found to be effective by 1989. Two important ones that have not yet been mentioned are antenatal classes and “tight” control of diabetes, both of them essential and effective in antenatal care.

Antenatal classes include a wide range of services with different philosophies and great differences in content. Common features usually found in such classes include reviews of the mechanisms of labour and birth, participant discussion, and relaxation techniques, controlled breathing, or attention-focusing manoeuvres for use of the woman in labour. Frequently, partners and friends participate in these classes too. Given the wide range of services offered, evaluation is a difficult challenge. There is evidence (21) that suggests that the woman in labour who has participated in such classes feels less pain and uses fewer analgesics, but overall, there is little evidence of the effectiveness of antenatal classes (22). It is certain that the classes have been related to changes in care toward a more women-centred type of care (21), which is considered a good outcome in itself. In the absence of definitive evaluations, experts recommend antenatal classes for all pregnant women.

Effective treatment of diabetes can prevent serious complications. Maternal diabetes can lead to a number of problems, including high birth weight of the newborn, urinary tract infections, hypertension, pre-term labour, respiratory distress syndrome in the newborn, an increased Caesarean

birth rate and high perinatal mortality. Effective treatment of diabetes during pregnancy can largely prevent these problems. (23) However, a debate continues as to whether “very tight” or “tight” control is superior. Walkinshaw (18) finds no evidence to support the use of very tight control instead of tight control. Hunter (23) also points to a need for improving the care of a diabetic woman by providing fewer interventions and avoiding interventions of unproven benefit. On the other hand, the treatment of gestational diabetes – that is, of abnormal glucose levels in the mother that are related to pregnancy – has uncertain benefits and definite harmful side effects. Walkinshaw (24) finds insufficient evidence to evaluate dietary therapy of gestational diabetes. There is an urgent need to define risks and validate therapies in this area (25).

An important issue still being debated today in many countries is whether every woman needs to be attended by a physician (or obstetrician). In a number of countries, especially those in Scandinavia and northern Europe, the midwife is an independent practitioner who has the legal right to practice midwifery without supervision by a physician, taking responsibility as main care giver for the pregnant woman. Available evidence (6, 12, 26) indicates that midwifery care results in equal outcomes of care, with some advantages accruing from midwife care, most notably a lower frequency of interventions and enhanced maternal satisfaction. Therefore, the evidence is strong that antenatal care by midwives and doctors results in equivalent medical outcomes. It should be noted, however, that this evidence relates to midwives who have gone through formal training in midwifery, and it may not be applicable to others who may be called midwives.

Hodnett (27) concludes that the specific advantages due to midwives and those due to continuity of care are difficult to separate, but that continuity of care by one health care provider does have rather clear benefits. Hodnett identified two randomized trials on continuity, both of which were of good quality, and both of which compared continuous care by midwives with care by a team of physicians and midwives. Women cared for in the continuous model were less likely to be admitted to the hospital before delivery, were more likely to attend antenatal educational programmes and were less likely to ask for drugs to relieve pain in labour and delivery. Their newborn babies were also less likely to require resuscitation at the time of birth. There were no differences in important health outcomes for mother and child. In addition, the women in the continuous model were more likely to be pleased with their care in the antenatal period and in labour and delivery.

Available evidence also supports the importance of social and psychological support during pregnancy. Studies (28) have found substantial advantages in social and psychological support, and an indication of reduced frequency of physical morbidity in pregnant women. Such support includes counselling that covers existing and potential problems as well as aspects of normal pregnancy. Pregnant women prefer receiving continuity of care and social and psychological support, and such continuity has beneficial effects, with no evidence of adverse effects (5, 6, 27). Care giver support is also effective during labour and delivery (29, 30).

Antenatal care activities not found to be effective

The USPSTF singles out a few antenatal interventions not supported by evidence of benefit. They include the following interventions that are used with high frequency in some countries.

- “Routine third-trimester ultrasound examination of the fetus is not recommended. There is insufficient evidence to recommend for or against routine ultrasound examination in the second trimester in low-risk pregnant women.” (4, p. 407) The Cochrane Review agrees (31) that no benefit to mother or baby has been demonstrated.
- “Routine electronic fetal monitoring for low-risk women in labor is not recommended. There is insufficient evidence to recommend for or against intrapartum electronic fetal monitoring for high-risk pregnant women.” (4, p. 433)
- “There is insufficient evidence to recommend for or against home uterine activity monitoring (HUAM) in high-risk pregnancies as a screening test for preterm labor, but recommendations against its use may be made on other grounds. HUAM is not

recommended in normal-risk pregnancies.” (4, p. 443) The Cochrane Review agrees (32) that no benefit has been demonstrated.

Chalmers, Enkin and Keirse (5) also present a long list of practices that should be abandoned in the light of available evidence. Some of the most noteworthy of the practices still in widespread use in many countries include:

- failing to involve women in decisions about their care;
- advising restriction of weight gain, advice that a recent Cochrane update (33) finds unlikely to benefit the mother and possibly harmful to the fetus;
- measuring weight gain routinely;
- restricting salt intake, a practice from which a recent Cochrane update (34) finds no evidence of benefit;
- measuring height at each visit.

While treatment of high blood pressure, including that associated with pre-eclampsia, is effective, the use of anticonvulsants in this case has unclear benefits (35). If anticonvulsants are used, magnesium sulfate is advised.

Another questionable practice in widespread use around the world is formal risk scoring, which often uses systems that have been developed locally. Risk scoring is a poor predictor of birth outcomes (36, 20, p. 52). Such scoring may be beneficial in some settings, in the sense that it encourages care in poor countries and settings where it otherwise might not be obtained. Risk scoring is an integral part of the new WHO model to determine low-risk pregnancy (see next section). However, in many European settings, risk scoring often leads to excessive interventions, especially prophylactic drug treatment and cervical cerclage, a surgical procedure to close the cervix (37).

Current debate in the field

A crucial debate today in the field of antenatal care is the extent of services that should be offered to women with low-risk pregnancies. It is well known that such women will generally have a good outcome for both themselves and their children without any interventions. Therefore, how much monitoring and screening is enough?

Studies have shown that reducing the intensity and number of antenatal visits for low-risk women has no effects on maternal or infant outcomes, but some women who have fewer visits report that their expectations of care were not entirely fulfilled.

The World Health Organization has organized a multicentre and multi-country randomized trial to test a new model of routine antenatal care (38, 1). The new model focuses on examinations and procedures known to be effective and involves fewer visits (an average of five compared with eight for standard care) and fewer interventions aside from those identified for particular cases. Outcomes for the two groups were similar. However, women in the new model were less satisfied with the number and spacing of visits than women in the standard model were. On the other hand, more women in the new model considered that the amount of time spent with doctors and midwives was about right. Costs were investigated in detail in two countries, where a trend toward lower costs was found in the new model. The authors noted that if all interventions included in antenatal care were scrutinized or tested for effectiveness, it would result in an even simpler model with fewer visits.

The new WHO antenatal care model (39) is based on this evidence. This model is intended for women who have no evidence of pregnancy-related complications, medical conditions or major health-related risk factors. The model lays out a four-visit schedule with a detailed listing of all important and evidence-based interventions (see Annex 3).

Unfortunately, it may be that some countries cut services without considering the positive effects of social support during pregnancy. The attempts to cut unnecessary medical services seem a laudable goal. However, diminishing human contact and care may not be wise or desirable.

Other aspects

Cost-effectiveness of antenatal care

Although the expenditures on antenatal care need to be justified, few studies of the costs or cost-effectiveness of antenatal care have been carried out. The problem is not a lack of appropriate methods. Such methods are available and could be applied to screening (4, 40, 41).

However, awareness of cost-effectiveness issues has been growing, and some arguments for changing antenatal care are based at least partially on cost-effectiveness considerations. For example, moves to simplify antenatal care and make it less intensive, at least for low-risk pregnancies, are based on cost-effectiveness considerations. Expensive technological interventions such as home uterine monitoring and excessive routine ultrasound examinations that have not been found to be beneficial could be largely dropped from antenatal care, saving scarce resources and having little or no effect on outcomes.

As noted in the previous section, it seems likely that a simpler model of antenatal care could be provided, especially to low-risk women, with fewer procedures and possible savings in cost. However, one randomized trial of reducing the number of visits for low-risk women found that the antenatal care cost reduction was offset by a higher rate of special or intensive care for newborns. Women were also less satisfied with the care in the reduced model (42). On the other hand, three other randomized trials (43, 44, 45) found that antenatal care that was provided by midwives rather than doctors resulted in equivalent medical outcomes, higher satisfaction and lower costs.

In summary, while only limited conclusions concerning the general cost-effectiveness of antenatal care can be reached, there is evidence that continuous care for the pregnant woman by a single provider such as a midwife is more cost-effective than care by a team of providers such as physicians and midwives.

Ethical considerations in antenatal care

The major ethical issue in antenatal care concerns access. When an intervention clearly benefits maternal and child health, is it ethical not to provide it routinely? On the other hand, is it ethical to provide intensive antenatal care to low-risk pregnant women, wasting scarce resources that could be used elsewhere and perhaps causing harm?

Particularly successful cases from the European Region

Most of the countries in western Europe provide routine antenatal care to all pregnant women. One result of this policy is exceptionally good results for pregnancy.

Unsuccessful cases from the European Region

The main problem with antenatal care in Europe is uneven access. In western Europe, full coverage for antenatal care appears to exist in every country. In eastern Europe, the countries that have made a transition from the Soviet model of health care to social insurance seem to provide full coverage for antenatal care. In the other countries, anecdotal reports indicate problems of access due to incomplete coverage, geographic problems etc.

Despite relatively good knowledge of what should be offered to which women during pregnancy, ineffective procedures are still common in antenatal care. This situation seems largely a case of excessive faith in technological examinations and interventions.

There is no ready source of information to indicate whether or not the antenatal care package in a given country has been examined to identify procedures that could be dropped and to assure that beneficial and cost-effective procedures are included. Anecdotes indicate that such examinations are uncommon and may be confined to a few countries in western Europe.

Conditions for successful implementation

Antenatal care needs to be provided for all pregnant women, preferably with public funds. The main issue raised by this report is the increasing role of evaluation in determining the content of antenatal care. The important perspective is one of balance: provide enough appropriate antenatal care for the specific individual.

In some countries, medicolegal pressures have made it difficult to cut unneeded services for pregnant women. Most undesirable outcomes occur in women not predictably at risk, but courts in the United States, Canada and the United Kingdom have found physicians guilty for not providing low-risk women with services appropriate for only high-risk pregnancies. Therefore, obstetricians may provide services that they feel to be unnecessary. This problem may need to be addressed by policy-makers.

Conclusions

Antenatal care is an essential part of modern health care. Any health care programme that sincerely wishes to improve the health of its population must pay serious attention to the health of the pregnant woman and her fetus. Such care is every woman's right.

1. Antenatal care is one of the most important health care services. Every pregnant woman needs full access to antenatal services, which also need to be organized and paid for. In addition, it is desirable that they be monitored periodically to assure appropriateness and high quality. The most cost-effective model of care thus far demonstrated is that provided to a low-risk pregnant woman by a midwife. The new WHO model of antenatal care presents a detailed plan for cost-effective care for women with uncomplicated pregnancies (see Annex 3).
2. Excessive, unneeded and unproven interventions are often provided to women with normal pregnancies. Services can be considerably reduced in such cases without any health consequences and with potential monetary savings. Conversely, research during the last 20 years has demonstrated the value of certain routine services that should always be part of antenatal care.
3. Many interventions in antenatal care still have not been evaluated. The potential for research in this field remains large. Research needs to focus on factors that identify high-risk pregnancies and on the health benefits of specific interventions, both old and new.

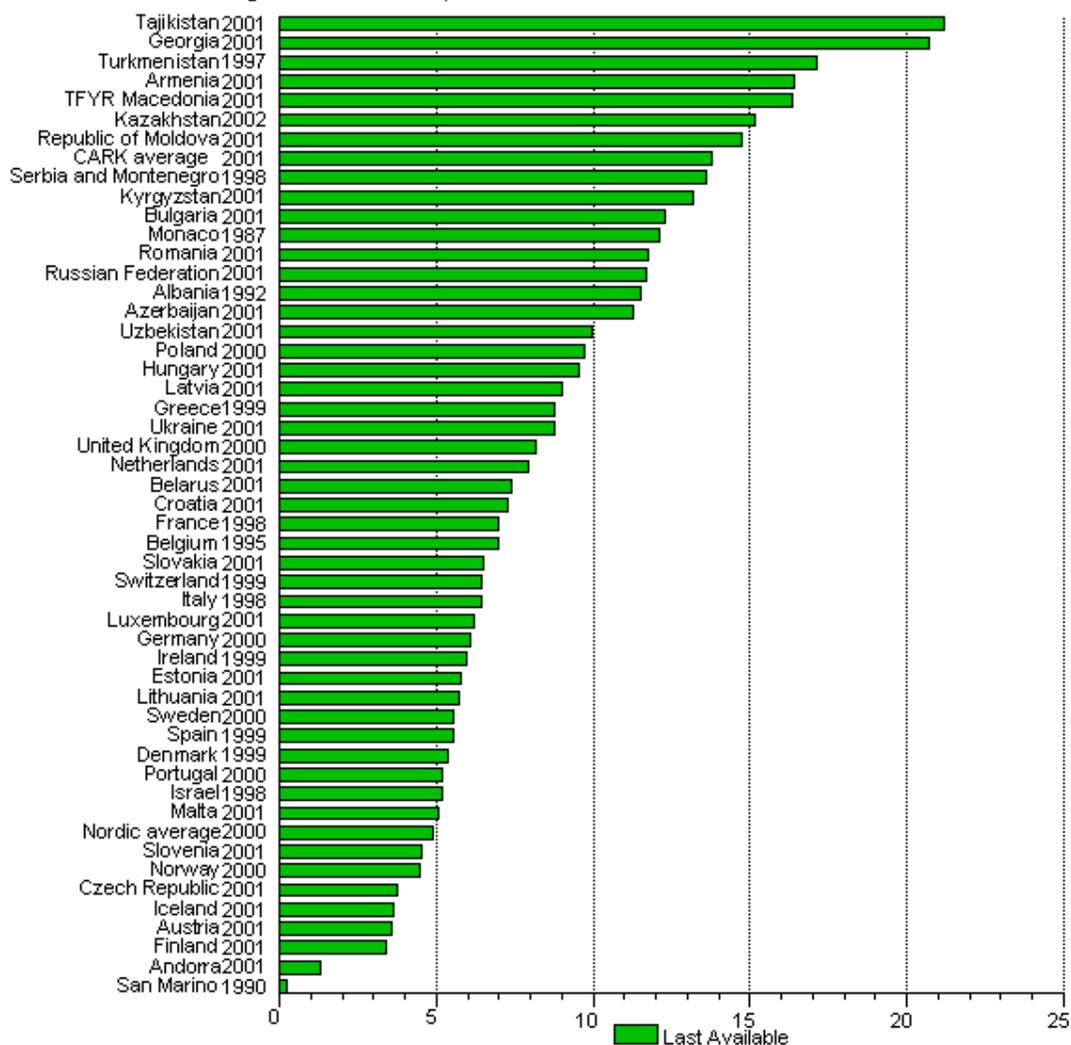
References

1. Villar J et al. WHO antenatal care randomized trial for the evaluation of a new model of routine antenatal care. *Lancet*, 2001, 357:1551–1564.
2. Banta HD, Houd S, Suarez Ojeda E. Prenatal care: an introduction. *International Journal of Technology Assessment in Health Care*, 1985, 1:783–788.
3. Chalmers I. Evaluating the effects of care during pregnancy and childbirth. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:3–38.
4. United States Preventive Services Task Force (USPSTF). *Guide to clinical preventive services*, 2nd ed. Baltimore, Williams & Wilkins, 1996. (Note: 3rd ed. is in preparation, with updates released incrementally at <http://www.ahcpr.gov/clinic/cps3dix.htm>.)
5. Chalmers I, Enkin M, Keirse M. Effective care in pregnancy and childbirth: a synopsis for guiding practice and research. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:1465–1477.
6. Khan-Neelofur D, Gülmezoglu M, Villar J. Who should provide routine antenatal care for low-risk women, and how often? A systematic review of randomized controlled trials. *Paediatric and Perinatal Epidemiology*, 1998, 12(Suppl. 2):7–26.
7. Villar J et al. Patterns of routine antenatal care for low-risk pregnancy (Cochrane Review). *The Cochrane Library*, 2003(3).
8. Wallenburg H. Detecting hypertensive disorder of pregnancy. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:382–402.
9. Duley L, Henderson-Smart DJ. Drugs for treatment of very high blood pressure during pregnancy (Cochrane Review). *The Cochrane Library*, 2003(3).
10. Crowther CA. Anti-D administration in pregnancy for preventing Rhesus alloimmunisation (Cochrane Review). *The Cochrane Library*, 2003(3).
11. Mahomed K. Iron and folate supplementation in pregnancy (Cochrane Review). *The Cochrane Library*, 2002(1).
12. Turnbull D et al. Randomised, controlled trial of efficacy of midwife-managed care. *Lancet*, 1996, 348:213–218.
13. Lumley J, Oliver S, Waters E. Interventions for promoting smoking cessation during pregnancy (Cochrane Review). *The Cochrane Library*, 2003(2).
14. Brocklehurst P, Volmink J. Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection (Cochrane Review). *The Cochrane Library*, 2003(3).
15. Smaill F. Antibiotics for asymptomatic bacteriuria in pregnancy (Cochrane Review). *The Cochrane Library*, 2003(3).
16. Crowley P. Prophylactic corticosteroids for preterm birth (Cochrane Review). *The Cochrane Library*, 2003(3).
17. Walker G. Antibiotics for syphilis diagnosed during pregnancy (Cochrane Review). *The Cochrane Library*, 2003(1).
18. Walkinshaw S. Very tight versus tight control for diabetes in pregnancy (Cochrane Review). *The Cochrane Library*, 2003(1).
19. Kramer M. Balanced protein/energy supplementation in pregnancy (Cochrane Review). *The Cochrane Library*, 2002(1).
20. Enkin M, Keirse M, Chalmers I. *A guide to effective care in pregnancy and childbirth*. Oxford, Oxford University Press, 2000.
21. Simkin P, Enkin M. Antenatal classes. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:318–332.
22. Gagnon A. Individual or group antenatal education for childbirth/parenthood (Cochrane Review). *The Cochrane Library*, 2003(1).
23. Hunter D. Diabetes in pregnancy. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:678–593.
24. Walkinshaw S. Dietary regulation for “gestational diabetes” (Cochrane Review). *The Cochrane Library*, 2003(1).

25. Hunter D, Keirse M. Gestational diabetes. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:403–410.
26. Robinson S. The role of the midwife. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:3–38.
27. Hodnett D. Continuity of caregivers for care during pregnancy and childbirth (Cochrane Review). *The Cochrane Library*, 2003(1).
28. Elbourne D, Oakley A, Chalmers I. Social and psychological support during pregnancy. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:221–236.
29. Hodnett D. Caregiver support for women during childbirth (Cochrane Review). *The Cochrane Library*, 2002(1).
30. Hodnett D et al. Continuous supportive care during childbirth (Cochrane Review). *The Cochrane Library*, 2003(3).
31. Bricker L, Neilson P. Routine Doppler ultrasound in pregnancy (Cochrane Review). *The Cochrane Library*, 2003(3).
32. Pattison N, McCowan L. Cardiotocography for antepartum fetal assessment (Cochrane Review). *The Cochrane Library*, 2003(1).
33. Kramer MS. Energy/protein restriction for high weight-for-height or weight gain during pregnancy (Cochrane Review). *The Cochrane Library*, 2003(3).
34. Duley L, Henderson-Smart D. Reduced salt intake compared to normal dietary salt, or high intake, in pregnancy (Cochrane Review). *The Cochrane Library*, 2003(2).
35. Duley L, Gülmezoglu A, Henderson-Smart D. Magnesium sulphate and other anticonvulsants for women with pre-eclampsia (Cochrane Review). *The Cochrane Library*, 2003(2).
36. Hall P. Rethinking risk. *Canadian Family Physician*, 1994, 40:1239–1244.
37. Alexander S, Keirse M. Formal risk scoring during pregnancy. In: Chalmers I, Enkin M, Keirse M, eds. *Effective care in pregnancy and childbirth*. New York, Oxford University Press, 1989:345–365.
38. Lumbiganon P et al., eds. A randomized controlled trial for the evaluation of a new antenatal care model. *Paediatric and Perinatal Epidemiology*, 1998, 12(Suppl. 2).
39. Villar J, Bergsjø J. *WHO antenatal care randomized trial: manual for the implementation of the new model*. Geneva, World Health Organization (WHO), 2002 (http://www.who.int/reproductive-health/publications/RHR_01_30/RHR_01_30_contents.en.html, accessed 30 January 2004).
40. Drummond M, Stoddart G, Torrance W. *Methods for the economic evaluation of health care programmes*. Oxford, Oxford Medical Publications, 1987.
41. Gold MR et al., eds. *Cost-effectiveness in health and medicine*. Oxford, Oxford University Press, 1996.
42. Henderson J et al. An economic evaluation comparing two schedules of antenatal visits. *Journal of Health Services Research and Policy*, 2000, 5:69–75.
43. Ratcliffe J, Ryan M, Tucker J. The costs of alternative types of routine antenatal care for low-risk women: shared care vs. care by general practitioners and community midwives. *Journal of Health Services Research and Policy*, 1996, 1:135–140.
44. Rowley M et al. Continuity of care by a midwife team versus routine care during pregnancy and birth: a randomized trial. *Medical Journal of Australia*, 1995, 163:289–293.
45. Young D et al. A new style of midwife-managed antenatal care: costs and satisfaction. *British Journal of Midwifery*, 1997, 5:540–545.
46. World Health Organization (WHO). *The WHO reproductive health library*, 5th ed [CD-ROM]. Geneva, 2002.
47. Banta HD et al. Health promotion and disease prevention as a complement to community health indicators, Working Group 1: Report of the European Collaboration for Health Technology Assessment. *International Journal of Technology Assessment in Health Care*, 2002, 18:238–272.

Annex 1. Perinatal and maternal deaths

Fig 1: Perinatal deaths per 1000 births

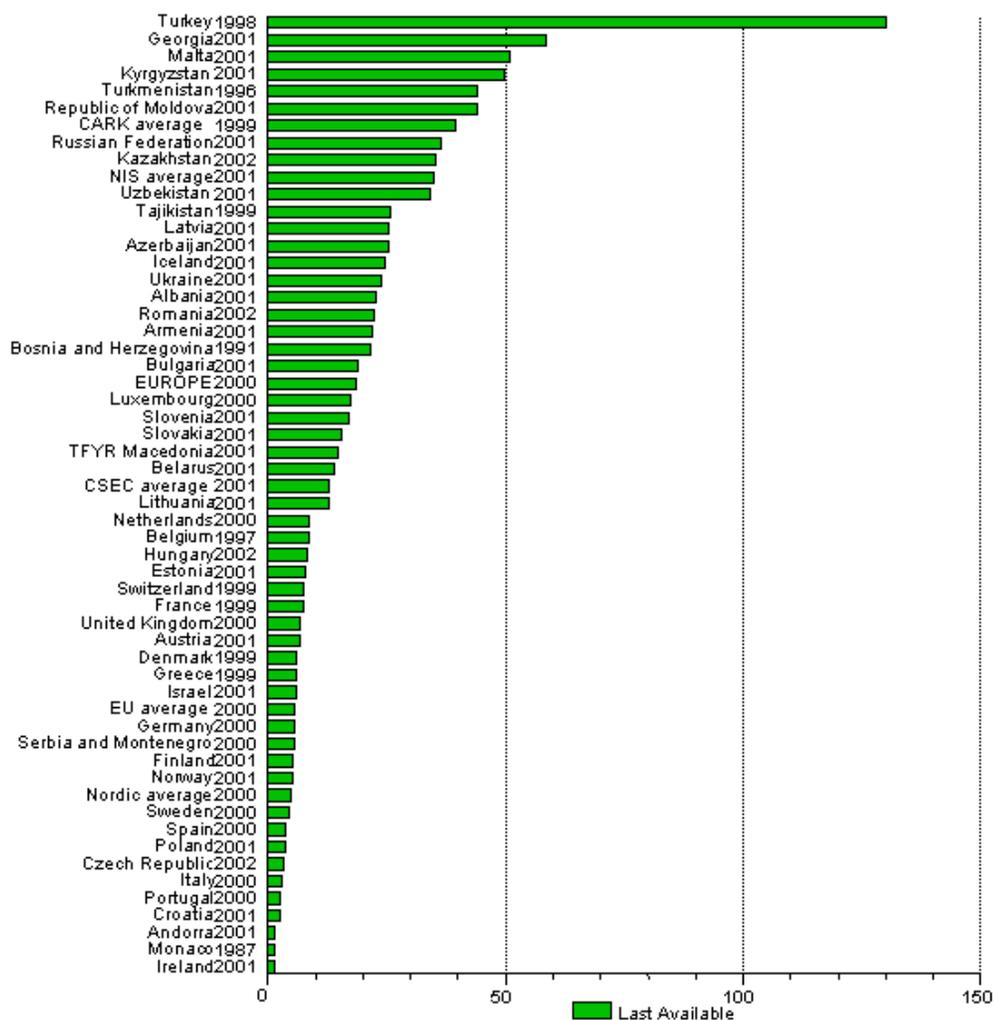


Source: WHO Regional Office for Europe, European health for all database, 2003.

Note: Figures are for latest available year.

CARK: central Asian republics and Kazakhstan.

Fig. 2. Maternal deaths per 100 000 live births



Source: WHO Regional Office for Europe, European health for all database, 2003.

Note: Figures are for latest available year.

CARK: central Asian republics and Kazakhstan; CSEC: central and southern European countries; EU: European Union; NIS: newly independent states of the former Soviet Union.

Annex 2. Search strategy

Antenatal care has been subject to original research and systematic reviews of such research for many years. Most notable in this regard is the enormous synthesis of evidence by Chalmers, Enkin and Keirse (5) of interventions in pregnancy and childbirth. The basic format and content of the case depends heavily on this book. Since the book's publication, the Cochrane Collaboration has formed, updating and extending much of its work. Together, they are the two primary sources for this review. Many of the reports and other materials are available through the WHO Reproductive Health Library on CD-ROM (46), developed as a collaboration between WHO, the Cochrane Collaboration and institutions and scientists in developing countries. Furthermore, national and regional public health technology assessment (HTA) and programmes had carried out and published reports on 156 projects in the area of prevention by June 2001; six of these dealt with antenatal care, and another four covered various subjects in general maternal and child health (47). The USPSTF has reviewed (4) a number of interventions in antenatal care. This review has also drawn on these sources.

Other sources of synthesis information were consulted, including the Canadian Task Force on Prevention and the Database of Abstracts of Reviews of Effects (DARE), but as their content was very similar to the sources already named, they are not referenced here.

Certain original studies referred to in these sources were consulted to deepen the coverage of selected subjects. These original studies are to be found in the reference list. The references were identified mainly through the Cochrane Library.

Economic studies were sought through the National Health Service (NHS) Economic Evaluation Database, part of the NHS Centre for Review and Dissemination at the University of York. Because of the small number of entries, studies were also sought in reference lists from articles referenced in this report. As indicated in the text, few economic studies were identified. Only one true cost-effectiveness study of antenatal care as a whole was found; that study is summarized in the text of the report. Other studies with cost information are also briefly described in the text.

The World Health Organization (Headquarters) was very helpful in sending copies of certain key articles on the subject of antenatal care.

Annex 3. The new WHO antenatal care model basic component checklist

Source: Villar J, Bergsjø J. *WHO antenatal care randomized trial: manual for the implementation*. Geneva, World Health Organization (WHO), 2002 (http://www.who.int/reproductive-health/publications/RHR_01_30/RHR_01_30_abstract.en.html).

Fig. 3. New WHO antenatal care model basic component checklist

Note: Mark the activities carried out as appropriate (unshaded boxes). (Use the closest gestational age at the time of visit.)

Name of patient _____

Address & telephone no. _____

Clinic record no. _____

FIRST VISIT for all women at first contact with clinics, regardless of gestational age. If first visit later than recommended, carry out all activities up to that time DATE: / /	Visits			
	1st 4th <12 wks	2nd	3rd	
<i>Classifying form</i> which indicates eligibility for the basic component of the programme				
Clinical examination				
Clinically severe anaemia? Hb test				
Obstetric exam: gestational age estimation, uterine height				
Gynaecological exam (can be postponed until second visit)				
Blood pressure taken				
Maternal weight/height				
Rapid syphilis test performed, detection of symptomatic sexually transmitted infections				
Urine test (multiple dipstick) performed				
Blood type and Rh requested				
Tetanus toxoid given				
Iron/folic acid supplementation provided				
Recommendation for emergencies / hotline for emergencies				
Complete antenatal card				
SECOND VISIT and SUBSEQUENT VISITS <i>Gestational age – approx. # of weeks</i> DATE: / / 26wks 32wks 38wks				
Clinical examination for anaemia				
Obstetric exam: gestational age estimation, uterine height, fetal heart rate				
Blood pressure taken				
Maternal weight (only women with low weight at first visit)				
Urine test for protein (only nulliparous women and women with previous pre-eclampsia)				
Iron/folic acid supplementation given				
Recommendation for emergencies				
Complete antenatal card				
THIRD VISIT: add to second visit DATE: / /				
Haemoglobin test requested				
Tetanus toxoid (second dose)				
Instructions for delivery/plan for birth				

Recommendations for lactation/contraception				
FOURTH VISIT: add to second and third visits DATE: / /				
Detection of breech presentation and referral for external cephalic version				
Complete antenatal card, recommend that it be brought to hospital				

Staff member responsible for antenatal care:
 Name _____

Signature _____